Estimating the Effect of the PVMS(Portable Variable Speed Message System) on Safety in a Work Zone

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1. Introduction

This study conducted the estimation of the effectiveness of the PVMS on safety. The measures of effectiveness are selected as the difference in speeds and the percentage of speeding. The evaluation was carried over a work zone which reduced from two lanes to one lane.(Refer to Figure 1) The two PVMSs were implemented in two points. The one is located in 500m upstream from the transition and the other in the 100m upstream. The former displays the information of 'Close 1-lane' and the latter displays alternatively the information of '60km/h' and 'Slow Down'.(Refer to Figure 2) Portable detectors were used to collect speed data at the interval of 100m upstream from the beginning point of the transition.

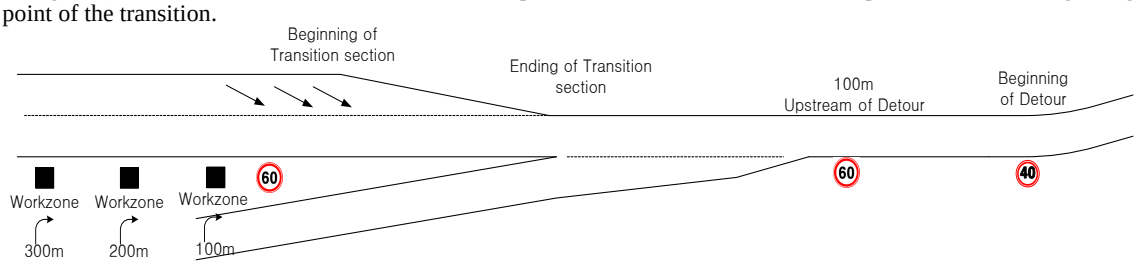

Figure 1. Layout of the work zone

Figure 2. PVMS employed in the beginning and ending points of the work zone

2. Approach

The main questions addressed during the safey analyses were as followings:

1) Were mean speeds after implementing the PVSM reduced compared to before the PVMS?
2) If there was a decrease in the mean speeds, what amount of decrease occurred? Can the decrease be attributed to the PVMS?
3) In addition to mean speeds, were median speeds, 85th percentile speeds, and the percentage of vehicles exceeding the speed limit by more than 10 mph affected by the PVMS?

To answer these questions, we quantified the safety effect of the PVMS between the treatment and non-treatment. To quantify statistically the changes in mean speeds, median speeds, 85th percentile speeds, and the percentage of vehicles exceeding the speed limit by more than 10 mph, regression model and logistic regression model were used.

3. Results of Analysis

The results of the 'before' and 'after' study show the following:

1) The standard deviation of the speed in the near of the transition was lower in the 'after' than the 'before', but there were no the big difference in the standard deviation in the others.
2) The mean and 85th speed of the 'after' were lower about 5km/h than the 'before'. The differences appeared to be statistically significant at the significant level of 5%.
3) The percentage of speeding for the 'after' had a decrease in 57% compared to the 'before'.

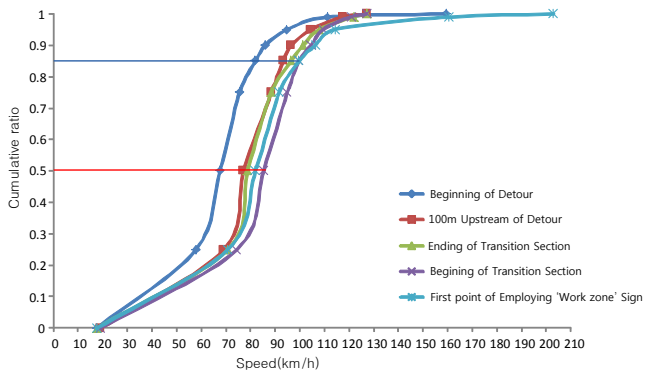

Figure 3. Cumulative speed distribution of the 'before'

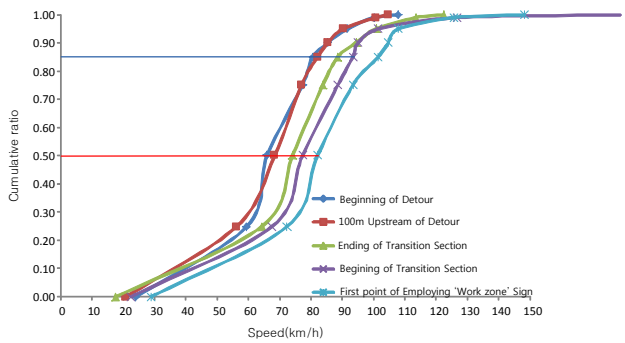

Figure 4. Cumulative speed distribution of the 'after'

4. Conclusion

Therefore, the PVMS would be contributed to benefit safety in a work zone which there is a difference in design speed of the adjacent normal section.

5. References

[1] Jaepil Moon and Joseph E. Hummer, "Speed Enforcement Cameras in Charlotte, North Carolina: Estimation of Longer-Term Effects", Transportation Research Record, No. 2182(2010), pp. 31-39.
[2] Christopher M. Cunningham, Joseph E. Hummer, and Jaepil Moon, "Analysis of Automated Speed Enforcement Cameras in Charlotte, North Carolina", Transportation Research Record, No. 2078(2008), pp. 127-134.